PROCEEDINGS

OF

THE ROYAL SOCIETY.

1830–1831. No. 6.

June 9, 1831.

HIS ROYAL HIGHNESS THE DUKE OF SUSSEX, K.G., President, in the Chair.

The Hon. Frederick de Roos, and Edward Coleman, Esq., were elected Fellows of the Society.

The following Presents were received, and thanks ordered for them :—

Transactions of the Cambridge Philosophical Society. Vol. 3, Part 3 ; and Vol. 4, Part 1. 4to.—*Presented by the Society.*

Zoological Society.—Report at the Anniversary Meeting, 1831.

———— Notices of Proceedings (March 8 to May 10, 1831). 8vo.—*The Society.*

Yorkshire Philosophical Society.—Annual Report for 1830. 8vo. —*The Society.*

Astronomical Observations made at the Radcliffe Observatory, Oxford ; from April 30, 1830, to April 30, 1831. By Professor Rigaud, F.R.S., folio MS.—*The Radcliffe Trustees.*

Astronomical Observations made at the Observatory of Cambridge. By G. B. Airy, M.A. Vol. 3: 1830. 4to.—*Professor Airy.*

A new illustrated Road Book of the Route from London to Naples, containing Twenty-four highly finished Views. Part 1. London to Paris. By W. Brockedon, Esq. 8vo.—*The Author.*

A Volume containing various Documents, and a Lecture, relative to the Prevention of Shipwreck; and an Essay on the Extinction and Prevention of destructive Fires. By Captain G. W. Manby. 8vo.—*The Author.*

Nuovo Desideratum di Chine Vere e di Specie Affini, di V. L. Brera, M.D. 4to.—*The Author.*

The Valley of Gosau in the Salzburgh Alps; drawn from Nature, and on Stone, by Charlotte Murchison. (Two impressions.)—*Mrs. Murchison.*

A Portrait Sketch of Frederick Albert Winsor, Originator of Public Gas Lighting, and Founder of the first established Gas Light Companies in England and in France.—*F. A. Winsor, Esq.*

A paper was read, entitled "Researches in Physical Astronomy." By J. W. Lubbock, Esq., V.P. and Treasurer of the Royal Society.

The author extends, in the present paper, the equations he has already given for determining the planetary inequalities, as far as the terms depending on the squares and products of the eccentricities, to

the terms depending on the cubes of the eccentricities and quantities of that order, which he does by means of a table, similar to the one given in his lunar theory; and applies them particularly to the determination of the great inequality of Jupiter, or at least such part of it as depends on the first power of the disturbing force. That part which depends on the square of the disturbing force may, he thinks, be most easily calculated by the methods given in his lunar theory. He recommends it as particularly convenient to designate the arguments of the planetary disturbances by indices. The bulk of the paper is occupied by the tables, and by examples demonstrating their use.

A paper was read, "On the Theory of the Elliptic Transcendents." By James Ivory, A.M., F.R.S., &c.

Fagnani discovered that the two arcs of the periphery of a given ellipse may be determined in many ways, so that their difference shall be equal to an assignable straight line; and proved that any arc of a lemniscate, like that of a circle, may be multiplified any number of times, or may be subdivided into any number of equal parts, by finite algebraic equations. What he had accomplished with respect to the arcs of the lemniscates, which are expressed by a particular elliptic integral, Euler extended to all transcendents of the same class. Landen showed that the arcs of the hyperbola may be reduced, by a proper transformation, to those of an ellipse. Lagrange furnished us with a general method for changing an elliptic function into another having a different modulus; a process which greatly facilitates the numerical calculation of this class of integrals. Legendre distributed the elliptic functions into distinct classes, and reduced them to a regular theory, developing many of their properties which were before unknown, and introducing many important additions and improvements in the theory. Mr. Abel of Christiana happily conceived the idea of expressing the amplitude of an elliptic function in terms of the function itself, which led to the discovery of many new and useful properties. Mr. Jacobi proved, by a different method, that an elliptic function may be transformed in innumerable ways into another similar function, to which it bears constantly the same proportion. But his demonstrations require long and complicated calculations; and the train of deductions he pursues does not lead naturally to the truths which are proved, nor does it present in a connected view all the conclusions which the theory embraces. The author of the present paper gives a comprehensive view of the theory in its full extent, and deduces all the connected truths from the same principle. He finds that the sines or cosines of the amplitudes, used in the transformations, are analogous to the sines or cosines of two circular arcs, one of which is a multiple of the other; so that the former quantities are changed into the latter when the modulus is supposed to vanish in the algebraic expression. Hence he is enabled to transfer to the elliptic transcendents the same methods of investigation that succeed in the circle: a procedure which renders the demonstrations considerably shorter, and which removes most of the difficulties, in consequence of the close analogy that subsists between the two cases.